

Chapter 5.

10. You are hired to design a reliable byte-stream protocol that uses a sliding window (like TCP). This protocol will run over a 1 Gbps network. The RTT of the network is 140 ms, and the maximum segment life is 60 seconds. How many bits would you include in the Advertised Window and Sequence Number fields of your protocol header?

12. Suppose TCP operates over a 1-Gbps link.

(a) How long would it take for the TCP sequence numbers which has 32 bits to wrap around completely? Assume the minimum packet size is 40 bytes.

(b) Suppose an added 32-bit timestamp field increments 1000 times during the wraparound you found above. How long would it take for the timestamp to wrap around?

Chapter 6.

16. Assume that TCP implements an extension that allows advertised window sizes much larger than 64 KB. Suppose that you are using this extended TCP over a 1-Gbps link with a latency of 100 ms to transfer a 10-MB file, and the TCP receive window is 1 MB. If TCP sends 1-KB packets (assuming no congestion and no lost packets):

(a) How many RTTs does it take until slow start opens the send window to 1 MB?

(b) How many RTTs does it take to send the file?

(c) If the time to send the file is given by the number of required RTTs multiplied by the link latency, what is the effective throughput for the transfer? In other words, what percentage of the link bandwidth is utilized?